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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
09/285,986	04/05/99	CHEU	S TSMC98-403

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MM91/0731

EXAMINER	
BEREZNY, N	
ART UNIT	PAPER NUMBER

2813

DATE MAILED: 07/31/01

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

Office Action Summary

Application No.

09/285,986

Applicant(s)

CHEU ET AL.

Examiner

Nema O Berezny

Art Unit

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 24 May 2001.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-25 and 27-30 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-25, 27-30 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-25 and 27-30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dass et al. (6,143,668) in view of Fu et al. (5,807,787). Dass discloses providing top level interconnecting lines (col.1 lines 26-29) and top level bond pads (Fig.5 el.55) comprising aluminum and aluminum/copper alloy (col.2 lines 42-46), formed on a semiconductor substrate comprising circuit elements therein (col.1 lines 26-33); depositing a passivation layer of silicon nitride over said interconnect lines and said bond pads (el.60; col.2 lines 46-48); depositing a photosensitive polyimide layer (el.65) over said passivation layer; patterning and etching said polyimide layer above said bond pads (Fig.6); then patterning and etching said passivation layer above said bond pads using He/NF(3), thereby exposing said bond pads (Fig.7; col.2 lines 61-62); then curing and cross-linking said polyimide layer (col.2 lines 63-65), wherein said patterned and etched polyimide is not removed (Fig.8; col.2 lines 63-65). However, Dass does not disclose forming an insulating layer over the main semiconductor substrate surface, or depositing two passivation layers, or forming interconnect lines comprising aluminum or aluminum/copper, or forming a bond pad thickness of 4000 – 8000 Angstroms, or

forming a polyimide thickness of 5.0 – 9.5 microns, or specific claimed deposition, etching, and curing parameters.

Fu discloses a method of forming bonding pads, comprising: forming an insulating film of silicon oxide over the semiconductor substrate main surface (col.4 lines 8-28); depositing two passivation layers using PECVD at a temperature between 350 and 450 degrees C (col.5 lines 18-21), comprising a plasma enhanced oxide layer and a plasma enhanced silicon nitride layer (col.5 lines 14-18) over said insulation layer and over said interconnects and bond pads (col.5 lines 25-26), which comprise aluminum and aluminum/copper alloy (col.4 lines 11-12); and depositing a photosensitive polyimide layer (col.5 lines 37-40) at a thickness of 5.0 – 9.5 microns (col.5 lines 47-49). The two said passivation layers have a thickness of 7000 – 12,000 Angstroms; the oxide passivation layer uses Ar/CF(4) as an etchant (col.5 lines 27-30); the bond pad thickness is 4000 – 8000 Angstroms (col.5 lines 8-9); the polyimide is patterned and etched by cross-linking with ultra-violet radiation through a mask, and the non-cross-linked polyimide is dissolved away in a solvent over the bond pads (claim 8); and the polyimide is cured in a nitrogen ambient at a temperature of 300 – 400 degrees C for 1.5 – 2.5 hours (claim 9).

Therefore, it would have been obvious to a person skilled in the art at the time of the invention to use the method of Fu with the method of Dass for forming bonding pads. The two passivation layers of Fu offer the benefits of both an oxide layer, which can relieve stress and therefore avoid cracking, and a nitride layer, which has better moisture resistance than silicon dioxide (Microelectronics Packaging Handbook II,

p.477-478). The claimed layer thicknesses and formation parameters are commonly fabricated and practiced within the semiconductor industry in order to produce optimum operating results of a semiconductor device. Both Dass and Fu are fabricating bonding pads and a method of improving the performance of said pads, and therefore, Dass would have used most or all of the fabrication and operating parameters of Fu.

Dass and Fu do not disclose depositing the first passivation layer at a pressure of 2.0 – 2.8 Torr for 8 – 12 seconds, and the second passivation layer at a pressure of 4.0 – 5.0 Torr for 50 – 60 seconds; or etching the first passivation layer at a pressure of .30 – .40 Torr for 33 – 39 seconds, and the second passivation layer at a pressure of 1.2 – 1.3 Torr for 20 – 30 seconds. The specification contains no disclosure of either the critical nature of the claimed operating parameters or any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen dimensions or upon another variable recited in a claim, the Applicant must show that the chosen dimensions are critical. In re Woodruff, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

Response to Arguments

Applicant's arguments filed 5-24-01 have been fully considered but they are not persuasive.

In response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies [i.e., interconnect lines that are adjacent to a bond pad (Response p.4); the occurrence

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of keyholes between closely spaced layers of interconnect metal (Response p.4,5); pitch size requirement (Response p.6); preventing surface damage to the passivation layer, providing a surface stress buffer, providing SOG planarization, preventing SOG surface cracking and delamination, reducing stress impact on the passivation layer surface, and preventing keyhole formation (Response p.9,10)] are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

Applicant contends in several statements that one or both references used in the prior Office Action (OA) rejection were lacking certain claimed elements. Each will be addressed below.

1) Dass discloses only a bonding pad, but does not disclose a pattern of metal interconnect lines (Response p.4). OA p.2, last sentence states that Dass discloses both interconnect lines and bond pads, found in Fig.5 element 55 and col.1 lines 26-29).

2) Dass does not disclose providing a thick layer of polyimide (Response p.5). OA p.3 para.2 states that Fu discloses a polyimide layer deposited over the patterned substrate (col.5 lines 37-40), at a thickness of 5.0 – 9.5 microns (col.5 lines 47-49).

3) Fu does not disclose the proper sequence of layer formation (Response p.7). OA p.2 last para. through p.3 first para. states that Dass discloses the claimed

sequence of layer formations in question, and the associated text location of said disclosures by Dass.

4) Neither Dass nor Fu disclose forming a bond pad on a semiconductor surface over which interconnect traces are also provided (Response p.8,9). See 1) above.

Applicant stated that all references to Dass relate to prior art methods and have no bearing on the Dass invention (Response p.5). OA stated in all instances that Dass disclosed certain elements, and not that Dass invented those elements. As Applicant also pointed out, all disclosures by Dass related to describing prior art; therefore, there was no improper mixing or substituting of Dass' invention with conventional steps.

Applicant states in the Response p.6-7, the problems associated with using photoresist to pattern the passivation layer over a bonding pad. Dass discloses using a photosensitive polyimide layer (element 65) over the passivation layer to pattern said passivation layer (OA p.3 first para.), as claimed by Applicant. In addition, there is no restriction in the claims from using photoresist.

In response to applicant's argument that there is no suggestion to combine the references (Response p.9,10), the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case,

Examiner disclosed in OA p.4 para.2 the reasons why it would be obvious to combine Fu with Dass, such as giving the known advantages of using the two different passivation layers of Fu. None of these reasons were directly addressed by Applicant. In addition, Fu discloses more than just the missing elements of Dass. Fu discloses several fabrication steps which are also disclosed by Dass and claimed by Applicant (stated in OA p.3-4), which suggests similar objectives and motivations for Dass and Fu.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

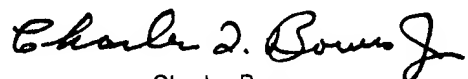
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Nema O Berezny whose telephone number is (703) 305-3445. The examiner can normally be reached on M-F 8:30-5:00.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Charles Bowers, Jr. can be reached on (703) 308-2417. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-7722 for regular communications and (703) 308-7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

NB
July 24, 2001

A handwritten signature in cursive script that reads "Charles D. Bowers Jr.".

Charles Bowers
Supervisory Patent Examiner
Technology Center 2800